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Abstract

This paper discusses the application of B2B e-commerce in Australia. It addresses e-procurement facilitated by e-markets as it applied to a large Australian organization. A model to facilitate e-procurement is discussed in detail for the different business applications of the organization. The model was developed to provide guidance to the organization as it moved from traditional purchasing to e-procurement. The findings from the application of the model and associated issues for further research are also presented.

***Key words**: E-markets, E-marketplace exchanges, B2B Exchanges, E-procurement, E-hubs*

1. Introduction

Australian businesses have increasingly adopted the Internet as an important tool for communication, research and a medium of business. The Australian Bureau of Statistics Report on Business Use of Information Technology (2000) indicates that from June 1998 to June 2000 the proportion of businesses accessing the Internet increased from 29 percent to 56 percent, while those with a web site increased from 6 percent to 16 percent. Australian companies using and developing Internet

business tools generated revenues of 28 billion dollars in 2000 and 2001, which represents around 4.3 per cent of Australia's GDP. Use of e-commerce in Australia is becoming widespread and proving to be beneficial. National Office for the Information Economy (NOIE) report (2001) indicates that 55% of the firms surveyed indicated that they had complemented their traditional business activities with e-commerce, and 62 % realised some cost savings and greater efficiencies.

Some B2B e-commerce in Australia developed from B2C e-commerce applications beginning with sell-side capabilities such as providing buyers with product and service information and allowing buyers to place orders online. B2C best practices such as searchable online catalogues and shopping cart functions were developed and implemented as B2B sell-side transactional capabilities, with online access to fulfilment data informing the customer of expected shipping date, delivery date and shipping status provided either by the seller or a third party logistics provider.

With the developments in B2B e-commerce, Australian businesses and the government, both at the State and Federal levels are increasingly adopting Web-based e-procurement capabilities to achieve volume purchase, a wider choice of buyers and suppliers, lower costs, better quality, improved delivery, and reduced paperwork and administrative costs. The benefits of e-procurement as described by Kalakota and Robinson (2001) fall into two major categories; effectiveness and efficiency. Effectiveness benefits include increased control over the supply chain, proactive management of key procurement data, and higher quality purchasing decisions within organisations. Efficiency benefits include lower procurement costs, faster cycle times, reduced maverick or unauthorised buying, more highly organised information, and tighter integration of the procurement function with key back-office systems. Other benefits identified from literature (Chaffey (2002), Turban (2002), Farhoomand and Lovelock (2001)) include reduced purchasing cycle time and cost, price transparency and improved budgetary control, elimination of administrative errors, improved information sharing and improved payment process.

The large amount of bid, order and transaction management for the B2B procurement of parts and supplies require assistance from auxiliary services such as e-markets (Thomson and Singh, 2001, Laudon and Traver, 2002). An 'e-market' functions as a trusted intermediary whose well-integrated business procedures and technology save costs and streamline the purchasing and sales processes (Swedish Trade Council, 2001). e-Markets proliferaed at an astounding rate because of the benefits they offer buyers and sellers. For buyers e-markets lower purchasing costs while reaching new suppliers. For suppliers e-markets lower sales costs and help the supplier reach new customers (Chaffey, 2002).

This paper presents a theoretical procurement model that was developed for a large Australian organization BHP Billiton as a business plan to move from traditional paper based procurement processes to e-procurement. The model provides a framework for optimizing the e-procurement process for B2B exchanges. It is based on value propositions specific to an industry consortium that are buyers and sellers to BHP Billiton. The impact of the model on e-procurement, the role of e-markets and resulting issues after implementation are discussed in this paper.

2. Literature Review

E-procurement is the electronic integration and management of all procurement activities including purchase request, authorisation, ordering, delivery and payment between a purchaser and a supplier (Chaffey, 2002). Rayport and Jaworski (2002) refer to e-procurement as a B2B e-commerce application with Web-based functions that allow employees of a buying organization to purchase goods and services and allow suppliers to manage and communicate the fulfilment of the purchase orders submitted. It includes catalogue management, requisition, control and approval, receiving and exception processing, and financials and payment processing. Thomson and Singh (2001) advocate that e-procurement processes include sourcing of buyers and sellers, a digital catalogue of products, online bidding, ordering, payments, goods dispatch notices (fulfilment), logistics and supply chain management.

Businesses buy a diverse set of products and services, ranging from paper clips to computer systems, from steel to machinery. At the broadest level these purchases have been classified by Kaplan et. al. (2000) into manufacturing inputs and operating inputs. Manufacturing inputs are raw materials and components that go directly into the manufactured product or manufacturing process. Manufacturing inputs tend to be vertical in nature, because the finished products they go into are industry specific. They are sourced from industry specific suppliers and distributors, and they require specialised logistics and fulfilment mechanisms. Operating inputs include indirect materials and services that do not go into finished products. These are sometimes called MRO (Maintenance, Repair and Operating) inputs which include industrial supplies, capital equipment, services and travel related goods. With the exception of capital equipment and some industrial supplies operating inputs are generally classified to be horizontal.

Systematic sourcing and spot sourcing of goods and services dominate business purchases and are based on corporate strategic marketplace servicing decisions. Systematic sourcing is buying through pre-negotiated contracts with qualified suppliers, is relationship oriented and contracts are long term. Spot sourcing is fulfilment of an immediate need, typically of a commoditised item for which it is less important to know the credibility of the supplier (Thomson and Singh, (2001) and Chaffey, (2002) and Christiaanse, et al.(2001)).

The primary driver of e-procurement is cost reductions achieved from efficiencies resulting in less staff time spent in searching and ordering products and reconciling deliveries with invoices (Chaffey, 2002). Savings also occur from automated validation of pre-approved spending budgets for individuals or departments leading to less time required for processing each order. Automated ordering, payment, confirmations, delivery and inventory information reduce paper work, costs of paper-based ordering forms, storage space for documents and files and improved information management. Indirect benefits of e-procurement include a shorter cycle time between order and use of supplies, greater flexibility in ordering goods from different suppliers, increased buyer productivity and lower prices through product standardisation and consolidation of buyers (Chaffey (2002) and Turban et. al.

(2002). While EDI has been the most common method for automating procurement in the past, its extent was limited by its substantial cost that made it only accessible to large firms with recurring volume purchases (Pavlou and Sawey 2002). The more ubiquitous Internet, which is also economically accessible to small-scale B2B exchanges, has further advantaged e-procurement.

2.1 E-marketplace

With an increased adoption of the Internet as a medium of business, e-marketplace growth continues at a rapid pace giving purchasers a new range of tools such as online buying and auctioning to exert price-pressure on suppliers. A business-to-business electronic marketplace has several buyers and several sellers. It is an arena on the Internet where a trusted intermediary (e-market) offers trading functionality to registering companies (Swedish Trade Council, 2001). An example of B2B e-Market is eSTEEL (www.esteel.com) that can be used by suppliers to expand their marketing reach, grow their customer base, and reduce their transaction costs. Buyers depend on eSTEEL to grow their base of suppliers, find better prices, and lower purchasing costs (Weill and Vitale (2001).

Businesses have no choice but to participate in e-marketplaces to survive, and to remain or become globally competitive. By March 2000, the automotive, aerospace and forest products industries all created their separate e-marketplaces; in April 2000, utilities, food, airline and rail individual e-marketplaces were established; and in May 2000, the mining and metals, hospitality and electronic industries created another set of individual e-marketplaces (Morgan Stanley Research Report, 2000). In the year 2000, more B2B exchanges evolved from 'dotcom' arrangements in Australia. These are evolving into interconnected marketplaces, particularly industry trading hubs and vertical exchanges with broad functionalities. Industry trading hubs enable improved supply chain integration between buyer and seller if they both have a web-based procurement capability, links between the participant's enterprise resource provisions (ERP) and e-marketplace, catalogue management and value added services capability (Stevenson, 2000).

Kalakota and Robinson (2001) suggest that e-Markets play a major role in industries that have a large market size, fragmented supply chain, unrecognised vendor or product differentiation, high information search costs, high product comparison costs and high work flow costs. E-markets or e-hubs that enable B2B purchases have been categorised by Kaplan et al (2000) as:

- MRO (maintenance, repair, operating) hubs, which are horizontal markets that enable systematic sourcing of operating inputs. Operating inputs tend to be low-value goods with relatively high transaction costs. Instead of licensing their software to individual companies, e-hubs provide an open market on their own servers, giving buyers access to consolidated MRO catalogues from a wide variety of suppliers;

- Yield managers are horizontal markets that enable spot sourcing of operating inputs such as manufacturing capacity, labour, and advertising. This type of e-hubs add value in situations with a high degree of price and demand volatility, such as the electricity and utility markets, or with huge fixed costs assets that cannot be liquidated or acquired quickly, such as manpower and manufacturing capacity;
- Vertical exchange markets that enable spot sourcing of manufacturing inputs and commodities. These online exchanges allow purchasing managers to smooth out the peaks and valleys in demand and supply by rapidly exchanging the commodities or near commodities needed for production. These exchanges maintain relationships with buyers and sellers, making it easy for them to conduct business without negotiating contracts or otherwise hashing out terms of relationships; and
- Vertical catalogue hubs that enable systematic sourcing of non-commodity manufacturing inputs. They bring together many suppliers at one easy-to-use web site. They can be industry specific, buyer focussed or seller focussed.

The appeal of doing business on the Web is clear. By bringing together a large number of buyers and sellers and by automating transactions, 'e-markets' expand the choices available to buyers, give sellers access to new customers, and reduce transaction costs for all the players. According to a recent estimate by the *Economist*, (2000) over 750 networked marketplaces have been developed worldwide. Some of these cover a wide variety of products and a diffuse group of buyers and sellers. Some sites offer broader functions for more targeted client groups. Australian 'e-markets' that have evolved in the last two years include corProcure (www.corProcure.com.au), Quadrem (www.quadrem.com.au,) BOMWeb (bomweb.com.au), Cable and Wireless Optus (www.cwomarketsite.com.au), and more recently the Australian government both at the Federal and State levels have been investigating e-marketplace options.

Given a higher comfort level with e-commerce, Australian firms are now entering into smaller electronic exchanges revolving around existing business relationships within their sector. These exchanges are termed private e-marketplaces and are part of the natural evolution of the electronic exchange business model. They provide customers with buy and sell services to enhance business, efficiencies and competitiveness. However, in the year 2001 consolidation of some e-markets took place in Australia leading to B2B online exchanges becoming mostly industry specific verticals dominated by Australian buyers and sellers (NOIE, 2001). Companies are taking their existing processes and trading networks online to gain connectivity and speed of the Internet, within a secure environment so that sensitive information and processes are not exposed to the world. A Virtual Private Network (VPN) is an enabling technology that allows companies to build cost effective private e-marketplaces or extranets that can typically operate within a sector. Eg. AANX (Australian Automotive Network exchange). A VPN allows players to have more effective management of their value network. The challenge for B2B e-

commerce is to enable interoperability between these multiple smaller electronic exchanges so firms can continue to do business across sectors.

2.2 The Role of E-Markets in E-Procurement

E-markets are inter-organisational information systems (intermediaries) that foster market based exchanges between agents in all transaction phases (Baldi and Borgman. 2001). An e-Market offers services that facilitate transactional and service needs. Services such as online auction applications provide sellers and buyers with basic information about products, prices and partners. Weill and Vitale (2001) and Zwass (2000) advocate that e-Markets provide easy search of products and services, product specifications which reduce communication costs for both buyers and sellers, enable dynamic pricing based on demand relationships, sales transactions that include payment and settlement, product delivery, market surveillance for stock market or auction results and enforcement of proper conduct by buyers and sellers. Benefits to those involved with operating e-marketplaces include the prospect of equity appreciation and a revenue stream through transaction and hosting fees and other value added services they provide.

Benefits to buyers of e-market facilitated procurement include efficiency gains from better pricing of goods and services, cost savings in the administration of procurement processes, consolidation of buyer's sub entities into a single buying unit, and reduced costs through purchasing aggregation for some items. Other non-quantifiable benefits include improvements in operations support, employee productivity, visible purchasing habits of business partners and supplier performance. Reduction in procure to pay cycle time, streamlined procurement operations, avoidance of costs associated with outsourcing procurement, and cost savings in invoicing, financing, goods insurance, and delivery are achieved (McGagh, 2000).

Suppliers on the other hand enjoy the benefits of lower administrative costs, use of standard online catalogues which can be quickly updated with new product information, more effective targeting and access to a wider range of buyers, and lower inventory and warehousing costs (McGagh, 2000). Other opportunities include lower marketing, selling and service costs, an expanded product and service offerings, improved cash flow through improved inventory turns and accounts receivables, pull versus push orientation with buyer organisations, a more detailed insight into a buyer's purchasing needs, and immediate responsiveness to a buyer's needs and virtual product or service bundling.

However, for each e-marketplace participant, the benefits will vary according to the participant's position. As buyers go to the e-marketplace for e- procurement, suppliers may not have any choice but to join in. Most suppliers are also buyers, therefore net effect is an increased participation in e-enabled procurement.

As Australian organizations move to conduct purchasing online, the need for apt business models to endorse e-procurement for different businesses are required.

The model addresses e-enabled strategic sourcing, e-enabled logistics and e-enabled acquisition. It was developed as a business plan for e-procurement at a large multi national organization BHP Billiton.

3. Proposed E-Procurement Model for BHP Billiton

BHP Billiton http://www.bhpbilliton.com/bb/home/home.jsp is a large multi national organisation based in Melbourne Australia. A theoretical model for e-procurement at BHP Billiton was developed as a business plan to e-enable their procurement process. The proposed model was to enable e-procurement of both operating inputs and manufacturing inputs, and the management of all procurement activities at BHP. It includes supply chain/value chain logistics for timely, cost effective delivery and acquisition for fulfilment of orders. To proceed with e-enabled procurement, BHP became a founding shareholder and initiated the development of two e-markets corProcure, http://www.corProcure.com.au and Quadrem http://www.Quadrem.com.

Each quadrant in the model has its own peculiar requirements, the knowledge of which will enable product placement based on selected value drivers. These include shareholder and business value through greater efficiency and improved pricing. The four quadrants of the model and their relationship with the supply chain and acquisition arrangements are briefly explained in the following section.

3.1 Buyer Model (few Buyers, many Sellers)

The buyer model is appropriate in cases where there are a large number of potential sellers and this may result in multiple or fragmented formats, where the buyer is able to leverage its buying power through the use of reverse auction tools. A reverse auction is where the winning bid is the lowest, rather than the highest. Such auctions are common where buyers desire to pay the lowest price for a product and so put the product to auction with suppliers. The supplier making the lowest bid offer wins. This is the reverse of the so-called *'English*' auction, where the highest bid offer wins. In this quadrant buying power is with the buyer. The sellers could end up incurring a high cost while upgrading systems and integrating it with buyer backend systems. The buyer in this model could capture substantial value for the big buyers in terms of pricing, quality and delivery terms.

3.2 Marketplace Model

The Marketplace Model is appropriate where value can be created through third party mediation of the matching process between buyers and sellers, or through

aggregation of buying or selling volumes. This model is appropriate for spot buying and sourcing in cross industries (horizontal) and within industry (vertical) markets for non-core (indirect) and core (direct) business products respectively (Kaplan, et al, 2000).

Although BHP in this model is only one buyer with numerous others, it was important to include this quadrant to enable indirect spot purchases such as hotel rooms for the employees of BHP and families of products such as stationery, cleaning products and services. Value proposition for buyers and sellers is that aggregation reduces transaction costs and mediation improves supply/demand matching. In this quadrant of the model revenue generation potential for e-markets is high. The focus is on price of product which sometimes tends to ignore the repercussions of supply chain issues and the need for new skills.

3.3 Longer Term Relationship Model

The Longer Term Relationship Model is appropriate for items requiring a high degree of planning between buyers and sellers either in the design stage or in fulfilment, typically strategic items. The importance of planning can be either due to technical complexity or demand characteristics driven by a time or phase requirement.

Value proposition for buyers and sellers is that concurrent design leads to reduced cycle time and improved manufacturability because the suppliers are part of the buyer's supply chain. Supply chain integration between buyers and sellers also improves customer service. Strategic relationship leads to few buyers and sellers which results in improved service, and reduces risks due to immature technical solutions. E-marketplace exchange enables the procurement of customised engineering and capital equipment from a small number of specialised suppliers, and sourcing of products where supply assurance is more important than price.

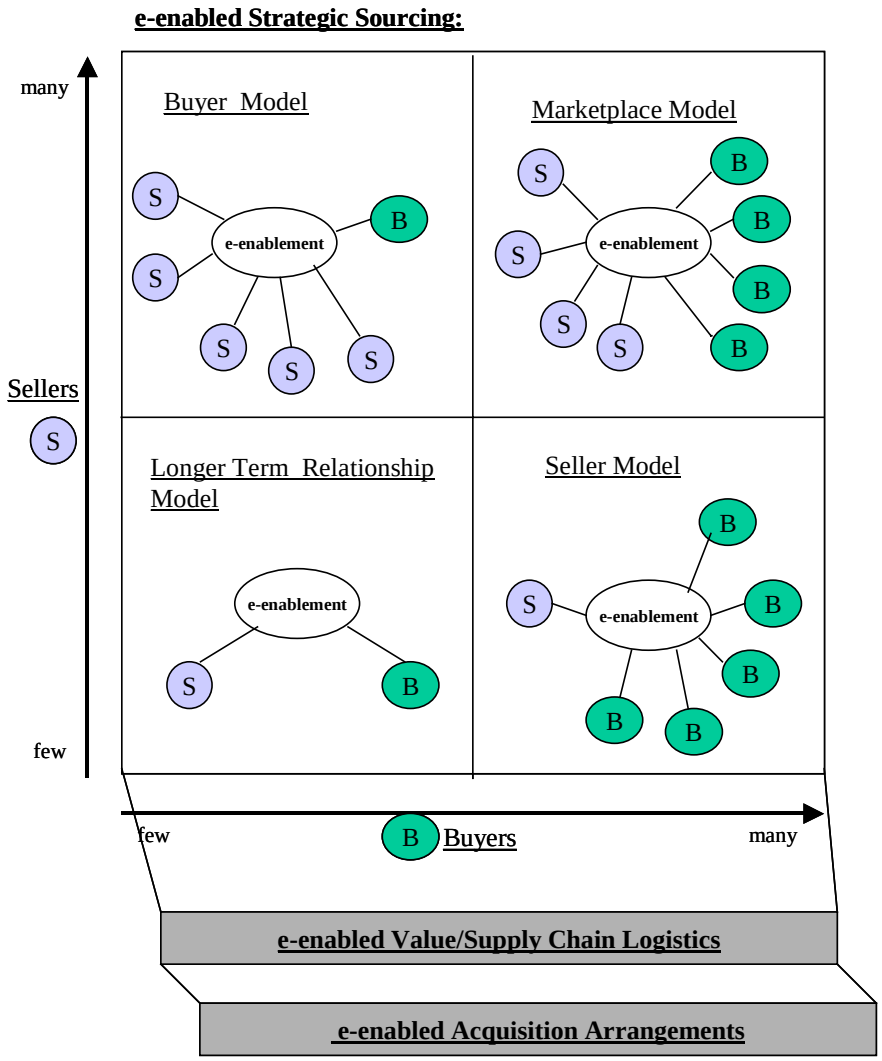

Figure 1: *An E-enabled Procurement Model for BHP Billiton*

3.4 Seller Model (few sellers, many buyers)

The Seller Model was included in this business plan because BHP is an important seller of items such as diamonds and ferrous metals to numerous buyers, who are businesses as well as individuals. This is based on B2C e-commerce. Value proposition for buyers is that seller provides product information on the Web to which buyers have '24x7' access. Sellers manage the Web content and catalogue at their expense. This is an effective opportunity for Small and Medium Enterprises (SMEs) to purchase online. In this quadrant the seller aims for monopoly/oligopoly

advantage, the buyer has one catalogue to search with facilities for cross cataloguing for product comparisons. The buyers may be faced with the costs of integrating their technologies with the supplier's back office Materials Requirements Planning (MRP) /Enterprise Resource Planning (ERP)/legacy systems or increased dependence on e-markets.

The above quadrants of the model allowed BHP to clearly identify where it and its products are in the marketplace and where it wants to be in the future to realise the opportunities of new technologies and processes.

3.5 Supply Chain Management and Logistics

Supply chain management is the coordination of material, information and financial flows between and among all the participating parties (Kalakota and Robinson 2001). It is an important entity of e-procurement for timely acquisition of goods and services.

Logistics is common across all business buy, do (manage) and sell functions. With the advent of e-commerce, traditional logistics is being radically transformed to meet the demands of agile, high-velocity, granular approach (Bayles, 2001). There are two main components to e-enabled logistics. These are the supply chain itself, and the e-enablement of logistics. On both the sell side and the buy side, it is necessary to provide an underpinning delivery service. E-enabled logistics order fulfilment process starts once the on-line customer clicks the 'buy' option. It is then the responsibility of an order management logistics system to confirm inventory availability, manage each item, make delivery arrangements, track the order through its lifecycle to completion on confirmation of its delivery by the carrier. E-enabled supply chain logistics fulfilment options include insourcing, outsourcing and virtual warehousing through suppliers. Logistics e-fulfilment requires a high degree of flexibility in infrastructure, people, and IT skills to adjust to various product mixes and unpredictable demand patterns. Whether e-fulfilment logistics is in-house, outsourced or virtual, costs of technology upgrades, re-engineered business process and an infrastructure to support logistics has to be put in place to attain efficiencies in product acquisition.

4. Application of the Model and Findings

The implementation of the model at BHP commenced late 2000. The outcome of the application of the model is discussed in the following section.

4.1 The Marketplace Model

The marketplace model was applied to procure A4 paper. It was facilitated by corProcure (e-market). Although corProcure was consortia based, supported and setup by many key buyers as Founding Shareholders who participated in the exchange, it sought the assistance of Price Waterhouse Coopers to provide corProcure with the engine for the reverse auction. In the process, corProcure engaged Price Waterhouse Coopers as a consultancy service. Suppliers and buyers agreed to the bidding rules, and product specifications in the form of a Request for Quotation were placed online. In this case no bids were made either because of the newness of the technology and process, or because most buyers and suppliers already had contracts or other relationships in place. As a result, the online exchange failed, however, participants felt they learnt a lot from the process. corProcure continued its rapid development, but has since been purchased by one of the Founding Shareholders, Australia Post.

4.2 The Buyer Model

The Buyer model for the procurement of hotel accommodation for BHP employees was first launched in December 2000 with hotels from two major cities, Sydney and Melbourne. BHP is a global multinational organization with operations in different parts of Australia as well as overseas which requires its employees to travel to these destinations for business. The first online bidding with a smaller number of participants was done to trial the process. The trial involved the purchase of hotel accommodation and associated services from Sydney and Melbourne based hotels. This reverse auction was facilitated by FreeMarkets.©com. FreeMarkets©.com is a Pittsburgh PA, USA based reverse auction e-market which provided the users training before the bidding took place, compiled relevant information and hosted the reverse auction. BHP being the buyer in this exchange largely depended on FreeMarkets© to ensure a successful bidding process. The services of FreeMarkets© were utilized since it was an experienced and well established international reverse auction provider for e-markets. Another exchange took place in February with hotel rooms and services suppliers from other regions of Australia and New Zealand. At the end of the bidding process a substantial saving in terms of costs were achieved by BHP, however, we do not have permission to release the sum. Transparency of information, which usually leads to open and fair deals, was also achieved. This model is also expected to be applied to the procurement of other families of products such as cleaning products and services and stationery.

4.3 The Longer Term Model

The longer term model was developed for the procurement of capital equipment. BHP considered applying this model with a large Original Equipment Manufacturer

(OEM) for the supply of specialised mining equipment; and one of its major assets and an energy supplier for the supply of significant amounts of power. This is yet to be implemented.

4.4 The Supplier Model

The supplier model was included in e-business plans at BHP to e-enable the sale of goods to buyers. BHP is a large supplier of coking coal, ferrous and other metals to numerous Australian and overseas buyers. In addition, BHP wished to try a pilot project to find out more about e-commerce, and to move the perception by its shareholders and the public generally that the company was moving from a 'bricks and mortar' old economy company to a 'clicks and mortar' new economy company. To do this it selected the sale of diamonds from its (then) newly acquired diamond mine. The supplier model is based on the B2C mode of selling, where the seller differentiates its products from its competitors. In the case of diamonds, the strategy was to emphasise the quality of the diamonds, the good value for money, a guarantee of quality in colour, carat, cut and clarity, and a disintermediation tag 'direct from mine to you'. However, the market was not yet ready for this type of retailing over the www for this type of product. While the product was successfully differentiated from its competitors and BHP moved a distance from its older image, there was a gap between a customer seeing, feeling and personal selection of a product of this type and being prepared to submit to a sale over the internet for a product of this value and nature. This is another aspect of the model which has not been successful.

5. Discussion

The above discussion highlights the fact that Australian organizations are increasingly adopting B2B e-commerce. The opportunities of e-procurement over traditional procurement has been realised although its successful implementation and opportunities are yet to be achieved. It is also evident that there is a gap between the anticipated and achieved benefits of e-procurement. The case study indicates that business organizations including buyers and sellers still lack confidence in the e-business processes due to it being new and unproven. Some are comfortable with the old arrangements, which were based on friendship, obligation and inter personal and inter company politics. An appropriate infrastructure with integrated systems, compatible technologies, common data bases, file formats and user interfaces, and secure transaction systems is required for quick retrieval of information in the procurement process.

Effectiveness in terms of supply chain management is yet to be realized although its successful implementation and opportunities are yet to be achieved. Better management of information and improved quality of products (hotel rooms) was

also achieved). Small efficiencies in terms of lower procurement costs, faster cycle times from online catalogues and online availability of product details was achieved.

Experienced and international E-market (FreeMarket) played an important role in e-enabled procurement by providing services such as search and evaluation, matching buyers and suppliers and the bidding process in the Buyer Model. It is clear from this research that Australian e-markets do not have the experience and the infrastructure required to support e-procurement for large organizations.

At the time the model was developed, benefits anticipated from e-procurement were large, however, it is now clear that the gap between the benefits achieved and anticipated is very wide. EDI was the main platform for the implementation of e-procurement at this organization and the business partners were those that BHP has been trading with. The benefits of new suppliers and buyers that can be acquired from the Internet were not possible.

Dependence on models for e-procurement indicates that business organizations are applying carefully planned business plans for B2B exchanges. The model presented above is an e-procurement road map, however, with further technological developments, business transformations and the unsuccessful aspects of the model company has conceded that it may have to be modified.

6. Conclusion

B2B e-commerce in Australia is clearly a case of evolution as firms grow accustomed to doing business electronically, and the realisation that it takes a lot longer to get off the ground than originally anticipated. With an increased emphasis on e-procurement as a widely accepted B2B e-commerce application, Australia saw a proliferation of e-markets, both as industry consortia and private. However, consolidation of e-markets due to high costs, a lack of skills and knowledge, the need for revenue models and the ability to continuously adapt to new business models has also taken place. The importance of collaborative arrangements for improved value chain in B2B exchanges is extremely important.

Although many of the issues will be evaluated from further research, it is apparent that for effective B2B exchange in Australia, standards for interoperability between business partners and technology integration for information exchange on goods and services is essential. Efficient and secure online payment methods, effective management of business relations and effective management of change from traditional to electronic process will contribute to the success of e-procurement. However, it is clear that e-procurement is an important B2B e-commerce application in Australia and that e-procurement models relevant to different organizations provide guidance and support the procurement process as well as enable evaluation. The role of e-markets in the e-procurement process is clear although the value of their services in the future has not been predicted. It is

apparent that a lot more education is required to build the confidence of both buyers and sellers for e-procurement for opportunities to become a reality.

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